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(2015)

Becoming-topologies of education: Deformations, networks and the database effect.

*Discourse : Studies in the Cultural Politics of Education*, 36(5), pp. 732-748.

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<http://doi.org/10.1080/01596306.2014.890411>

## Becoming-Topologies of Education: Deformations, Networks and the Database Effect<sup>1</sup>

All things originate from one another,  
and vanish into one another  
according to necessity ...  
In conformity with the order of time

Anaximander, On Nature

*This article uses topological approaches to suggest that education is becoming-topological. Analyses presented in a recent double issue of Theory, Culture & Society are used to demonstrate the utility of topology for education. In particular, the article explains education's topological character through examining the global convergence of education policy, testing and the discursive ranking of systems, schools and individuals in the promise of reforming education through the proliferation of regimes of testing at local and global levels that constitute a new form of governance through data. In this conceptualisation of global education policy changes in the form and nature of testing combine with the emergence of global policy network to change the nature of the local (national, regional, school, classroom) forces that operate through the 'system'. While these forces change, they work through a discursivity that produces disciplinary affects, but in a different way. This new-old disciplinarity, or 'database effect', is here represented through a topological approach because of its utility for conceiving education in an increasingly networked world.*

The increasing utility of topological approaches to understanding social phenomena was clearly demonstrated in a recent double-issue of *Theory, Culture & Society*. For its editors, attempts to understand the emerging social must engage with topology as “surfaces that are spaces in themselves are not only self-organizing and emergent, but their self-organization brings being and knowing, ontology and epistemology, into new kinds of relations” (Lury, Parisi, & Terranova, 2012, p. 20). Using a mathematical construct to conceptualize social spaces, which might otherwise be understood discursively, may appear unusual. The metaphysics of mathematics, however, has long engaged with the social, for example in Leibniz's concept of impossibility (Deleuze, 2006), Hacking's (1990) theorisation of statistics, governance and normalcy and Badiou's (2005) argument that mathematics is ontological and has always been significant for understanding multiplicity, continuity and the changes of forms and figures.

While this mathematical turn is important, particularly in the age of big data and the consequent impact of datafication on social ontologies and professional/personal subjectivities, the use of topology as a heuristic for articulating the becoming-self in education surfaces has only recently been used in wider education analysis (Lingard & Sellar, 2013; de Freitas, 2014). Using topology to understand cultures and societies is not new, since Euler's solution to the problem of the 7 Bridges of Königsberg, theorists have been intrigued by the potential of topology to tell us something about the ways that environments, people and customs/cultures connect in productive ways. For example, Lacan was absorbed by the potential for topological figures to “theorise the relationship of scientific

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<sup>1</sup> We are very grateful to Sam Sellar and Andrew Murphie for their helpful feedback and suggestions on early drafts of this paper. We would also like to thank the reviewers for their helpful comments.

knowledge and psychoanalytic truth” as well as the interactions between material culture, information technology and the public (Kalaidjian, 2012, p. 185). Lyotard, in *Libidinal Economy*, used the topological form of a Moebius strip to explain how the libidinal economy enters a given body:

zones are joined end to end in a band which has no back to it, a Moebius band which interests us not because it is closed, but because it is one-sided, a Moebian skin which, rather than being smooth, is on the contrary (is this topologically possible?) covered with roughness, corners, creases, cavities which when it passes on the 'first' turn will be cavities, but perhaps on the 'second', lumps (Lyotard, 1993, p. 2).

While concepts such as the libidinal economy may be well-known and utilised, the importance of the topological device has been less recognised. The significance of topology in theorising subjectivities with/in social and cultural formations is not new; rather, it has remained somewhat unattended to in the theorisation of diverse fields including education. Our fourfold focus in this paper is: to explain topology and topological surfaces; to argue that topologies are specific examples of Deleuze and Guattari’s concept of the assemblage; to explain education’s topological character and apply topological thinking to the apparent global convergence of education policy; before finally focusing on a specific example of the topological form of education, the proliferation of regimes of testing at local and global levels<sup>2</sup> as the intersection of topologies of assessment, policy and discursivity that is producing a new-old disciplinarity, or ‘database effect’ in local educational contexts.

We approach topology through Deleuze and Guattari’s theorisation of assemblages. Assemblages “select elements from the *milieus* (the surroundings, the context, the mediums in which the assemblages work) and bring them together in a particular way” (MacGregor Wise, 2005, p. 78). For Deleuze and Guattari, topology (as assemblage) is a theorisation of selection, and ordering, of elements and the connections and relationships made possible as a result of this ordering function. This is the concept of machinic connection, or the idea that assemblages have both structure and random connectedness, and we do not know what an assemblage is until we find out how it works through the connections made with other mechanisms and orderings. We stress that this is not purely a mechanical functioning, assemblages work in multiple dimensions beyond simple representation and description, every “assemblage is precisely this increase in the dimensions of a multiplicity that necessarily changes in nature as it expands its connections” (Deleuze & Guattari, 2005, p. 8). This is a mathematical operation of a specific kind, as the “number is no longer a universal concept measuring elements according to their emplacement in a given dimension, but has itself become a multiplicity that varies according to the dimensions considered” (Deleuze & Guattari, 2005, p. 8).

## Explaining topology

Topology is the “most general and fundamental branch of geometry” (Franklin, 1935, p. 39). It is sometimes called “qualitative mathematics: that is, mathematics without numbers,” concerned as it is with continuity and connections, or what we can say about the ways a shape can be changed, or

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<sup>2</sup> In this analysis, we use the terms local and global to distinguish the local-national coupling and the global-national coupling as the national (understood as those centralised educational and political assemblages that typify the modern nation-state) is imbricated in both architectures of power.

deformed, while retaining intrinsic qualities that do not change “when the object under consideration is subjected to stretching and bending *without tearing*” (Mansfield, 1963, p. 1). Topology is the “branch of mathematics whose purpose is to elucidate and investigate ideas of continuity” or those properties of figures that are preserved by homeomorphism, those “one-to-one mappings that are continuous together with their inverses” (Arkhangel'skii, 2012). de Freitas suggests that “topology is the study of local relationships, in that it is concerned with the proximity or connectedness of points and regions and to what extent this proximity or connectedness is maintained under particular kinds of transformations” (2014, p. 7).

Topology explains the contemporary patterning, flow and articulation of forces, power and subjectivity in specific terrains, or the “new order of spatiotemporal continuity for forms of economic, political and cultural life” (Lury, Parisi, & Terranova, 2012, p. 4). Topology is not simply a useful heuristic device. Education itself is “coming to display a proliferation of surfaces” that are becoming-topological. Multitudes of multiplicitous topologies interact, overlap and interpret each other in education. In this, education reflects “20<sup>th</sup>-century developments in the gridding of time and space, the proliferation of registers, filing and listing systems, the making and remaking of categories, the identification of populations, and the invention of logistics” (Lury, Parisi, & Terranova, 2012, p. 8). The “maximisation of relations” this produces “makes the analysis of the becoming topological of culture a pressing concern” (Lury, Parisi, & Terranova, 2012, p. 8).

Education is a multiplicity of topologies whose elements, principles, relations and surfaces are continually changing or deforming, without ever rupturing<sup>3</sup>. This is important as it explains why practices in education’s past always appear available despite continual deformation<sup>4</sup>. New topological relations and principles lead to formations and deformations in the elements and surfaces of the topologies that are education; for example policy reform, curriculum, assessment, testing, teacher registration and accreditation, classrooms, timetables, subjects, histories, data, teachers, students. All are becomings-topological that interact, deform, fold and enfold in ways that produce meanings, subjectivities and signifiances both internal and external to the objects themselves.

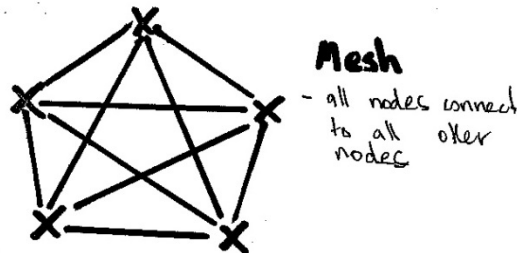
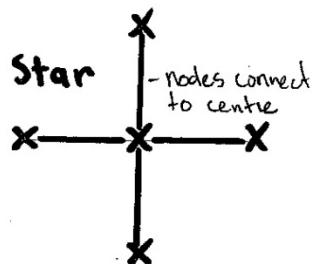
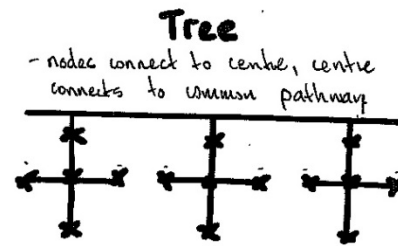
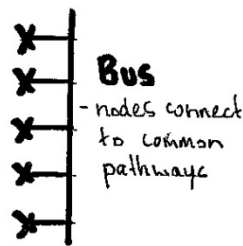
Surfaces are formed not through an outer edge but through the relatedness of their elements. A topology’s character is given by the qualities of the connections binding its elements and not its position in abstract external space-time. Topologies “do not... exist in time and space. Through their own energetics, they drive their own space and time” (Lash, 2012, p. 262). This internally-binding character of topological structures allows topologies to be thought of as networks. Networks derive their character not from the number of elements combined but from the way those elements are combined. Different forms of network topology express different relations and principles:

#### *Diagram 1: Network Topologies*

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<sup>3</sup> We follow Deleuze and Guattari in refusing to see this analysis as representation. Thus elements cannot be represented, once and for, as ‘this element with this nature’. Further, elements are relational, which means that it is exteriorities and interiorities that give them their character.

<sup>4</sup> Deformation is not being used in a way that intends some original form. We follow Deleuze and Guattari in believing that everything is conceived in the middle. Deformation, in our use, simply suggests a change from a particular (previous) form.



Networks, and network topology, are important in the context of digital information and communications technologies that produce relations never previously available. While elements have always belonged to more than one topology, the growth of networks facilitated by digital technologies is causing new spaces to emerge; relating more and more elements according to new principles. Thus, “the space in itself that is constituted in network topology is the space that increasingly defines the cultural dynamics of hyper-connected societies. In this regard, networks may perhaps be considered as a special case in the becoming topological of culture” (Lury, Parisi, & Terranova, 2012, p. 17). There are many examples in education: such as the ways that curriculum and assessment now appear in a multitude of global and local education topologies, while also functioning as elements in related topologies that effect commodification.

In topology, elements function in multiple surfaces and are affected by each surface (multiplicity). In this way, topology changes our understanding of “familiar social science objects of research by mapping out how such objects change and how they relate, in this process, to other changing objects in multiple, relational spaces” (Shields, 2012, p. 47). Multiplicity means that elements belong to more than one surface. An element that is part of two topologies is the site of three effects, the effects of each surface and the effects of the surfaces formed by the combination of both surfaces. This does not mean that all the topologies active at some point are equally affective at all times. While Taylorist elements of scientific management and education for efficiency may still resonate, there have been certain spaces and time where these elements were more affective. Another example is a man caught up in a religious cult, who “lives in a different sphere, on a different stage in an impenetrable inner space while he appears to be right here in the present” (Sloterdijk, 2012, p. 40). While one topology might have the greatest effect on a particular element, as long as the other topologies persist they will affect that element.

Another important attribute is that topologies continuously, though not always rapidly, change their internal dynamics, or deform. In our increasingly topological society,

movement – as the ordering of continuity – composes the forms of social and cultural life themselves. This is not... a matter of one rationality displacing the other, but of their overlapping and mutual implication such that the continuity of movement – or the continuum – becomes fundamental to contemporary culture (Lury, Parisi, & Terranova, 2012, pp. 5-6).

This continuous multiple deformation occurs across axes that are immanent to a topology and so deformation occurs along certain 'lines' or according to certain principles. The famous deformation of a coffee cup into a doughnut is possible because it follows the line/principle of 'having only one hole'. But topology also theorises

fuzzier, yet mathematically rigorous, 'shape consistency' under deformation. This can usefully be compared to other things that change yet are held to remain the same, such as a family or community or group – virtualities, that is, intangible-but-real-entities that remain despite turnover in membership (Shields, 2012, p. 47).

In topological thinking, unless one of the co-constitutive surfaces is ruptured, and its topological relation is lost, all topologies continue to produce effects.

So, unlike the virtual, which is beyond experience and the experienced actual, topological figures cut across the distinction of the virtual and actual. The movement, the process at stake is not the generation of an actual by a virtual, but the deformation of, as it were, two actuals into one another via their topological properties (Lash, 2012, p. 265).

Topological surfaces enfold and re-enfold each other in a complicated dance of continuously deforming multiplicity. The main questions concern the topological principles at work on an element and the ways they are inflected and deflected by other topological principles at work on and through that element.

The surface formed by, or as, the interaction between two or more topologies is an effect of the multiple binding principles at work in the various surfaces of which an element is a part. The immanence of the principles at work in every topological surface, though, means that the effects of the deformations of an element belonging to multiple surfaces are not found 'at the edges'. 'Interior' and 'exterior' make a different sense in topological thinking, as "insides and outsides are continuous ... borders of inclusion and exclusion do not coincide with the edges of a demarcated territory, and ... it is the mutable quality of relations that determines distance and proximity, rather than a singular and absolute measure" (Harvey, 2012, p. 78).

Local borders or zones do not act as barriers that obstruct or block global flows. Rather, they are "parameters that enable the channelling of flows and provide coordinates within which flows can be joined or segmented, connected or disconnected" (Mezzadra & Neilson, 2012, p. 59). When local and global topological structures interact, the effects of one are not privileged over those of the other (as occurs in topographies of 'higher' and 'lower'). This is not to say that one topology cannot take primacy in directing forces, at least for a time. It does so, however, because of its relation to all of the principles working through all of the enfolded topologies and not because it is 'on top'. In topology, relations and flows of forces can be reversed. And, "in a topological society, the nation is not necessarily bigger or stronger than, say, an electricity meter, and the domestic is not necessarily

situated at a lower level than a map of the world” (Marres, 2012, p. 295). Or, as Michael and Rosengarten put it, a topological approach “facilitates exploration of the relation between global and local without tacit recourse to an external framing or parametrization of one by the other that is found in much social science” (2012, p. 94).

### **Education is topological**

In arguing that education is topological we are not merely suggesting that topology is either a useful metaphor or a helpful heuristic device for analysing education. Rather, we contend that education is comprised of multiple topologies that continually operate as an encompassing topology, or assemblage, that we understand as education. Deleuze and Guattari suggest that we are in a milieu best described as a “typology and topology of multiplicities” (2005, p. 483). The educational assemblage is both one of **and** constituted by a limitless array of topologies that connect, sometimes fleetingly, sometimes in more sustained ways, to produce “social formations by machinic processes” (Deleuze & Guattari, 2005, p. 435). Increasingly global, or international, societies “are defined by the encompassment of heterogeneous social formations... precisely because these processes are variables of coexistence that are the object of a social topology, the various corresponding formations are coexistent” (Deleuze & Guattari, 2005, p. 435). Bernstein’s (1971) assertion that there are three sign or message systems of education, curriculum, pedagogy and evaluation, and Rizvi and Lingard’s (2010) extension that testing has become the fourth, are examples of such co-constitutive topologies that are machinic (connective) in their arrangement.

The education topological function at work in the assemblage is made up of multiple constant connections of topologies; architectural topologies, individualising surfaces, amassing topologies (e.g., census), knowledge topologies, semiotic surfaces, corporeal topologies, subjectivising topologies - recalling that every element or point exists in multiple topologies at multiple times. The ‘teacher’, for example, is actualised through multiple topological affects (including comportments, materials, curricula), as it is constructed by topologies that connect and by the ways those connections work; “forms... relate to populations, populations imply codes, and codes fundamentally include phenomena of relative decoding that are all the more usable, composable, and addable by virtue of being relative, always ‘beside’” (Deleuze & Guattari, 2005, p. 53). Co-constitutive topologies construct this subject ‘teacher’. Space is multi-dimensional and constituted through mutually implicated strata; so it is not hard to see the teaching as produced through these topological effects in the same space at the same time, as Green argued in the 1960s (Green, 1964-1965).

It is this co-constitution through multiple topologies that is crucial because they are coterminous, overlapping, connecting and continuously deforming. They are machinic, in being “simultaneously located at the intersection of the contents and expression on each stratum, and at the intersection of all of the strata with the plane of consistency. They rotate in all directions, like beacons” (Deleuze & Guattari, 2005, p. 73). Rotation, stretching, deforming, education is a dynamic topological affect at the molecular level. Analysing education, then, requires accounting for what Deleuze and Guattari referred to as the “tetravalence of the assemblage.” This requires addressing bodies, enunciations and their relations; for example in the context of the Crusades, this meant mapping the “interminglings of bodies defining feudalism: the body of the earth and the social body; the body of the overlord, vassal, and serf; the body of the knight and the horse and their new relation to the

stirrup; the weapons and tools assuring a symbiosis of bodies” as well as those “statements, expressions, the juridical regime of heraldry, all of the incorporeal transformations, in particular, oaths and their variables (the oath of obedience, but also the oath of love, etc.): the collective assemblage of enunciation” (2005, p. 89). Within each topological assemblage, what is important is the ways that lines of de/re/territorialisation (what Deleuze and Guattari refer to as “tensors”) form points of intersection between enunciative acts on the one hand, and the machinic assemblage of bodies, their attributes, actions and capacities on the other (2005).

### **The three topologies (among many): Policy networks, discursivity and assessment**

We cannot provide a complete account of the education assemblage in this paper. By focussing on three of its topologies, however, we can provide a topological account that reimagines the global convergence of education policy. It seems to us that a powerful example of the ways in which enunciative acts (what can be said, by whom, about what) are intersecting with the machinic assemblage of bodies (their attributes, capacities, desires) concerns the multiple topologies of policy, assessment and discursivity. Our argument is that this explains both the rise of global testing regimes as a policy mechanism and ‘how it works’ through the various affects and effects produced. The flow of policy from country to country requires a multiply enfolding space in which a reconfiguration at one point effects a reconfiguration at other points. Some surface is necessary for the transmission of “the economisation of schooling policy, the emergence of human capital and productivity rationales as meta-policy in education, and new accountabilities, including high-stakes testing and policy, as numbers, with both global and national features” (Lingard, 2010, p. 136). This transmission surface is the space formed through the rise of “policy networks” that constitute “new policy relationships and media” (Ball, 2012, p. 114).

Three of the topologies that connect to form and deform as the education surface are central to this analysis: policy networks, the discursive topology and the topology of assessment (which has given rise to forms of national and international high-stakes testing). We argue that in some cases the deformations, and in others the relative stability, of these topologies interact to produce a database effect that heightens an existential crisis, or crisis of subjectivity, within the education surface. The ‘crisis’ in education is not an isolated phenomenon, it manifests an effect that derives from globalising processes. The emergence of a global surface is itself a topological quality. Teachers and others experience anxiety as molar continuities (often operating through global registers) which produce molecular discontinuities in the dimension of the subject. This calls to mind Ball’s performative terror, or the ways in which policy technologies of markets, managerialism and performativity “does not simply change what people, as educators, scholars and researchers do, it changes who they are” (Ball, 2003, p. 215). This terror is exacted through the “judgements, comparisons and displays” that “serve as measures of productivity or output, or displays of ‘quality’” (Ball, 2003, p. 216). For Deleuze and Guattari, performativity exemplifies the move towards global certainty and assuredness, understood here as the supposed security and improvement of education reform through global rankings, that conceals the petty (or molecular) fears and insecurities of those subjected to these molar regimes.

When the machine becomes planetary or cosmic, there is an increasing tendency for assemblages to miniaturize, to become micro-assemblages... The administration of a great



organized molar security has as its correlate a whole micro-management of petty fears, a permanent molecular insecurity, to the point that the motto of domestic policymakers might be: a macropolitics of society by and for a micropolitics of insecurity (2005, pp. 216-217).

While some see this as emblematic of a shift to global governance, our contention is that this linking (understood as a folding) of global comparative technologies induce local affects, performativities and subjectivities that reassert the centrality of the local disciplinary function within education. We call this the database effect. This is the seeming paradox that the global testing topology, which creates flows in the emerging global space of education policymaking it produces and in the larger topology comprised of these three topologies (including Lyotard's lumps), actually returns a local disciplinary surface that produces intensified local affects that have been described variously as "performative terror" (Ball, 2003), the "anxieties and doubts" of individuals counted within "audit societies" (Power, 1999, p. xv) and existential fear (Author & Author, 2012) that is "played upon and accelerated by various aspects of contemporary culture" (O'Sullivan, 2006, p. 311). We agree with Grek (2009, p. 35), that we must not forget that the testing data is used by local and national policymakers in various ways to reconfigure and reform education. It is not that the State, and particularly its bureaucracies, are passing away, rather that it is expressing new technologies, implicating, and implicated by, new forces, changing intensities and redirecting flows on topological surfaces.

### **Policy Network Topology**

Education systems in most English-speaking countries are in the grip of an education policy movement that aims to homogenise education, particularly schools, by promoting education markets and increasing accountability through datafied transparency. This 'homogenisation' process requires a surface through which affects and effects are transmitted. This manifests "the spatialising of social relations, on travel and other forms of movement and other transnational interactions and forms of sociality" (2012, p. 5). Policy networks have formed in/as the transmission of specific affects. The use of standardised tests in high-stakes ways functions in the formation of a topologic space constituted as a global context governed by a "meta-policy, steering educational systems in particular directions with great effects in schools and on teacher practices, on curricula, as well as upon student learning" (Lingard, Martino, & Rezai-Rashti, 2013, p. 2). This is not a single education surface, however, or even a single education policy surface, as "homogenising effects... still manifest in specific ways in different nations" (Lingard, Martino, & Rezai-Rashti, 2013, p. 2).

This spread of this particular form of education policy is the result of global policy networks that organise and mobilise education differently, so that "significant changes are taking place in how policy and public services get 'done'" (Ball, 2012, p. 2). As Ball has suggested, "policy networks and communities are being established through which particular discourses and knowledge flow and gain legitimacy and credibility" (Ball, 2012, p. 9). Furthermore, these policy assemblages operate as heterarchies, or organisational forms that are complexes of "reciprocal, multilevel interdependencies" indicative of a new architecture of accountability, new forms of governance and subjectification within/across the postmodern state "which is dependent, flexible, reflexive and diffuse but centrally steered" (Ball & Junemann, 2012, pp. 138,139). As Lingard and Sellar suggest, Ball's (and Junemann's) "spatial mapping" of new policy assemblages and heterarchies is topological,

this “new policy topology” represents “changing relationships between mobile policy actors in new policy spaces that are composed by these mutable relationships” (Lingard & Sellar, 2013, p. 274). This topology represents those new networks and communities “located within a global architecture of political relations that not only involves national governments, but also IGOs [World Bank, OECD, International Finance Corporation, World Trade Organisation], transnational corporations and NGOs” (Rizvi & Lingard, 2010, p. 338). These policy networks operate through, what Grek refers to as, ‘hard’ and ‘soft’ forms of governing (2013). Hard forms continuously produce “data to foster competition”. Soft forms operate through attraction, such as by “drawing people in to take part in processes of mediation, brokering and ‘translation’, and embedding self-governance and steering at a distance through these processes and relations” (2013, p. 3).

Through these networks “new voices are given space within policy talk” (Ball, 2012, p. 6). What is particularly important is that policy networks constitute new ways of governance as policy *mobilities*, or what we would call topological deformations, these include “large-scale economic and political changes on the one hand, and cultural changes and changes in identity and subjectivity in the other” (Ball, 2012, p. 5). Of significance of this topology is the ways in which local and global configurations of space (themselves elements in many other topologies) interact, fold and work as flows of forces upon the policy surface. Global and local manifestations of space that call to mind Deleuze and Guattari’s concepts of smooth and striated space, are relational concepts, the “relative global” and the “local absolute” that enter into certain arrangements on topological surfaces and that work in certain ways (Deleuze & Guattari, 2005, p. 382). It is not one or the other, global and local function as interiority and exteriorities of flows and forces.

This policy network topology creates its own time, but gives the appearance of belonging to a linear space-time. The concept of accountability, for example, functions radically differently within the new policy topologies in which new practices, assemblages and subjectivities are direct results of new datafied accountabilities that are claimed to return accountabilities that we have always had. Teachers who are subjected to datafied transparency are not always subjected to physical inspection. A different topology, with different qualities, is now at work. Sahlberg describes a Global Education Reform Movement (GERM) that has 6 main characteristics; the increasing global standardisation “of and in education”; greater emphasis on literacy and numeracy in line with the international PISA and TIMSS/PIRLS tests; the “search for safe and low-risk ways to reach learning goals” that “minimises experimentation”; the adoption of business ideas regarding reform and innovation; the adoption of “test-based accountability policies”; and, finally, the “increased control of school” through the ideology of “open market based education [which] has expanded parental choice and school autonomy on the one hand but has also introduced stronger measures of control over schools on the other” (Sahlberg, 2011, pp. 177-179). GERM’s features represent deformations within the multiple topologies of education. In this sense, time is important for topologies, albeit a non-linear time<sup>5</sup>.

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<sup>5</sup> Not to recognise the relational nature of space-time is to conceive of objects as existing in, rather than as collectively constituting, space-time. This is a contemporary manifestation of Leibniz’s “vision of a world in which everything lives not in space but immersed in a network of relationships. These relationships define space, and not the reverse” (Smolin, 2013, p. xxiii).

## **Discursive Topology**

Co-functioning with this policy topology is a discursive, or disciplinary, topology. Discourse operates in specific ways to legitimise and privilege certain truths, and instantiate specific regimes of truth, as correct or normal modes of conduct. Discourse refers to the “institutionalised use of language and language-like sign systems” through which the “individual emerges through the processes of social interaction, not as a relatively fixed end product but as one who is constituted and reconstituted through the various discursive practices in which they participate” (Davies & Harre, 1990, p. 48). Discourse produces subjectivities, in that the play of power “produces reality; it produces domains of objects and rituals of truth. The individual and the knowledge that may be gained of him belong to this production” (Foucault, 1991, p. 194). For Foucault, we must remember, “the subject is constituted not in language... but through many different types of practices. Some of these individualising practices are discursive (author function); others are institutional...” (Olssen, 1999, p. 31). Individualising practices are topological in that they arrange (assemble) elements from multiple surrounding, contexts and milieus in order to make them work in particular ways.

This discursive topology produces disciplinary affects by ordering that has important implications for the individual bodies located, arranged and capacitated. Discipline is a corporeal effect of discourse. It names the ways that bodies (as elements) are ordered; “meticulous control of the operations of the body, which assured constant subjection of its forces and imposed upon them a relation of docility-utility which might be called ‘disciplines’” (Foucault, 1991, p. 137). This is particularly true of schools, which “became a sort of apparatus of uninterrupted examination that duplicated along its entire length the operation of teaching... [becoming] increasingly a perpetual comparison of each and all that made it possible both to measure and to judge” (Foucault, 1991, p. 186). Discipline normalises through binarised discursive forms such as good/bad, right/wrong, true/false, normal/abnormal (Thompson, 2010). These binaries are affected through a “quantification... thanks to the continuous calculation of the plus and minus points, the disciplinary apparatuses hierarchised the good and the ‘bad’ subjects in relation to one another” (Foucault, 1991, pp. 180-181).

For Deleuze and Guattari, this discourse as language, serves as a sign system (signifiante) that fixes bodies within specific orderings, or affects “incorporeal transformations... applied directly to bodies and is inserted into the subject’s actions and passions” (Lambert, 2005, p. 36). They pay particular attention to order-words (such as teach, learn, good/bad), or the ways that statements, performative actions and social meanings are produced through extra-being affects that occur between the sense of a statement and the bodies who enunciate it. “There is no signifiante independent of dominant significations, nor is there subjectification independent of an established order of subjection. Both depend on the nature and transmission of order-words in a given social field” (Deleuze & Guattari, 2005, p. 79). Order-words function on the “plane of expression”, a topological surface that orders elements through language. Crucially, for Deleuze and Guattari the language function of order words have always been visible in education surfaces, as teaching does not so much “instruct as ‘insign’, give orders or commands” (2005, p. 75). Education is an assemblage that both maintains this plane of expression (and others) and is situated within it (and others) and applies this ordering function to the testing data generated.

## **Assessment Topology**

So, mass compulsory schooling has always operated through a discursive topology predicated on technologies of normalisation, surveillance and categorical sorting. If the discursive topology is largely linguistic and institutional, categorical sorting has often been enabled through the various mechanisms of assessment, and in particular how they have capacitated bodies within and through schooling, at play in each specific school context. For this analysis, we are most interested in standardised and high-stakes testing regimes which function as a specific zone within the assessment topology, as this has arguably become the most compelling assessment technology in the 21<sup>st</sup> century. The allure of these testing regimes is their promise(s) to provide rapid, quantitative evidence to drive education reform. This form of assessment affects a different, quantified ordering of elements that has its roots in “the application of business methods” to education reform, which began in the US around 1900 (Callahan, 1964, p. 5). Callahan argues that this went hand-in-hand with scientific management in government, as the “publicity given scientific management... intensified the public’s feeling that great waste existed everywhere, and at the same time offered a means of eliminating it” (1964, p. 47). Introducing systems in the 1900s to enumerate performance so as to evaluate it was fundamental to reforming policymaking. The result, for public servants including school teachers, was a push to quantify “their contribution to society or have their budgets cut” (Callahan, 1964, p. 48). The link between quantification and the assessment of quality, merit or worth through testing, has been performed for over one hundred years.

The principal function of the testing zone on the topological surface is to order pre-existing elements (recalling that points or elements can exist in more than one topology at the same time, so other orderings are also present). It is easy to see the way that enumeration is enfolded in a disciplinary discursive surface; for example, Au identifies John Franklin Bobbit as a pioneer of the ‘Taylorist efficiency through standardisation’ logic (2009, pp. 20-25). In this logic, standardised testing of teachers is crucial for delivering social efficiency; Au cites Bobbit’s (1913) argument that “principals and other administrators should use tests to determine ‘weak’ and ‘strong’ teachers as well as rates of teacher pay or access to other privileges” (2009, p. 22). The standardised testing of student achievement often used to measure teacher ‘efficiency’, system quality using the language of weak/strong, and the linking of student results to teachers’ pay are all examples of the disciplinary deformation of the numbers that are generated through testing that rely on a discursive language function that assigns bodies attributes and capacities. Testing, and indeed the whole assessment topology, has always functioned through the discursive topology – test results have disciplinary affects, and in this they enable a hierarchisation based on results which are always ordered as good/bad, acceptable/unacceptable, high quality/poor quality that present significant consequences for educators<sup>6</sup>.

The assessment topology is deforming, as new technologies enable more testing to be conducted, accessed, analysed and communicated, and aligning with new social and institutional logics that increase the frequency, range and impact of the testing. A feature of this technological impact is that of speed, like Virilio’s notion of “dromology”, the intensification of testing experienced in many sites

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<sup>6</sup> It must be stressed that hierarchisation is not the terminal effect of topologies as topologies can function in multiple dimensions, and hierarchies are three-dimensional shapes. We do not want to limit the usefulness of topological analyses to three dimensions. Rather, hierarchisation is an effect of what comes after the intersection of discursivity with the quantified data. The numbers must be interpreted, organised, communicated by those with authority so as to tell a story, and this, like most education stories, is configured around binarised language.

is enabled through the speed of data and its transmission (1986). While there is a long history of testing in local contexts, the generalisability (i.e., applicable to and meaningful for any student in any country), frequency, reach and speed of local and international testing, both in terms of conduct and the dissemination of results, are relatively recent phenomena. Deformation of the assessment topology, around the intensification of testing, has resulted in the “rescaling of educational politics and policy” through the “complementarity of global and national testing regimes (Lingard, Martino, & Rezai-Rashti, 2013, p. 2). This rescaling enables a series of comparisons that have local and global disciplinary effects “devised to both calculate and intervene in the performance of individuals and populations” (Ruppert, 2012, p. 120). The results produced through PISA tests, for example, allowed for the establishment of global “governance through comparison”, which has drawn more and more countries to desire testing, and to engage with global ranking in as both a measure of quality and as a source of international competition (Grek, 2009; Grek, 2013). The result is that, in many contexts, testing is the dominant expression of assessment as “through processes of constant comparison” many national and/or local education systems “shed their bounded logics, in favour of achieving a place in the global ‘order’ (Grek, 2013, p. 4).

### **Database Effect**

The database effect is a surface that expresses specific configurations of, and flows between, the three education topologies discussed here. It manifests machinic connections made when the topology formed by the discursive education topology, the policy network topology and the testing topology undergoes deformations that create specific practices of local disciplining using a global testing surface. If we think of the three topologies in isolation we fail to grasp the ensemble effect, in part, because the elements of the topologies seem remarkably persistent. Further, as Ruppert points out, database effects proliferate, rather than combine or augment, as “complexity, variation and uncertainty... are immanent to the government logic and conception of the subject that joined-up databases advance” (2012, p. 119).

Testing, nested within a broader topology of assessment, has been a feature of schooling for many decades, the discursive/disciplinary functioning of schooling is centuries old and policymakers have been concerned about quality and improvement to differentiate good and bad students/teachers/systems for some time. The first part of our argument is that the topologies associated with these affects have been deformed by the advent of new, principally digital, technologies that allow the collection, comparison and proliferation of data. This creates “standardized, inoperable and dynamic databases to support evidence based policy, enable individually tailored and targeted services, reduce costs and provide robust population statistics for analysis and research” (Ruppert, 2012, p. 119). Our second argument is that the new surface speaks to Deleuze’s control society, of “the ultrarapid free-floating control” that create teaching and learning as effects of the database, a continual deformation or abstraction of how teaching and learning have commonly been understood (1995, p. 178). The zone of testing within the assessment topology has undergone profound changes related to emergence of a global community of testing specialists, developments in computer technology and interconnectivity. It has produced a globalisable form of testing, which enable particular elements that deliver education (teachers, school, regions, nations) to be compared with elements in any space covered by the testing regime.

A topographical imagination would see this as the imposition of a new hierarchical axis of coercion/authority within the policy network structure, in which the global overrides the local. While this may be one way to perform power within this system, a topological imagination refuses to treat the local as extinguished by, or necessarily rendered subservient to, the global. On the contrary, our topological analysis reasserts the efficacy of local discursive disciplinary effects. In this, we agree with Grek's argument that many scholars "have put emphasis on the ways that the 'global' impacts on the 'national', but they have failed to acknowledge the extent to which the national is critical, if not *the* critical element, in the formation of global policy agendas" (Grek, 2013, p. 3). After all, in considering the consequences of global testing regimes we must remember that these are paid for by individual governments and used to promote various local narratives concerning success, or the lack of it. And, as many agree, the important thing about these policy networks is that they are changing identities and subjectivities, in other words, there are always 'local' effects of these network topologies.

So the database effect is not, as is often assumed, some form of surveillance topology through which a central international agency surveills local education systems as if they were in a global education panopticon. While a profound deformation of the testing topology has occurred as the emergence of a global high-stakes testing regime, this deformation has affected the discursive topology, which has reconfigured to (re)enfold the testing topology differently to produce local discursive disciplinary affects. In this new configuration, the tree topology of a global high-stakes testing regime reproduces differently the star-tree topological effects of local discursive observation (discipline)<sup>7</sup>. We stress that on any topological surface, different zones and intensities may manifest different orderings and configurations, however, of most interest to us are the star and mesh networks.

Testing, and the global policy networks, is built around the promise of mesh networks, limitless and continual comparison through data designed to effect some (positive) change. In other words, the promise of this data is that it will provide a "mesh" relationship between, and of, elements. In mesh networks, all forces can travel from any point to any other point. There is no central element to which all elements are connected and to which principal forces must flow. However, in our analyses, the discursive storying of the data means that this promise is not actualised. "Star" networks remain. In star networks, the principal forces always flow to and from a central element. There may be some leakage of force from secondary (non-central) element to secondary element. Relatedness to and from a centre, however, is the principle that governs the flows across this surface. In part, this failure manifests as a variety of unintended consequences, ranging from impacts on student wellbeing and motivation (Stobart, 2008; Jones, 2008), to pedagogy and curriculum in schools and classrooms

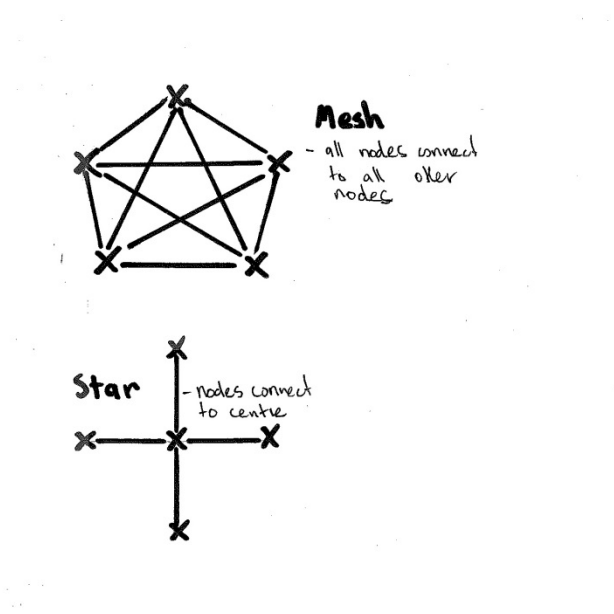
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<sup>7</sup> In topological terms, what we are seeing is a mesh network being reterritorialised as a star network, while this star topology projects (and misrepresents) itself as part of a tree network, in which the local policymaking centre defers to some global policymaking centre. Testing is a potential mesh network because it produces globally applicable tests that produce globally applicable data that can be synthesised and communicated to any point in the assessment topology. Actual communication between the elements is not locally promoted, so a mesh topological effect, in which all elements of the topology communicate with all other elements, is not produced. Indeed, the discourse of connection to all elements is all that is required. It is enough that the topology promises to deliver data that provides the quality of visibility from all observational points (parent, teacher, principal and policymaker in any country) that a mesh produces. Not only has this mesh not yet actualised, however, its qualities cannot be expressed while they are enfolded by a local discursive (disciplinary) topology. The consequences of every point communicating with every other point in a global education topology are not those that a local discursive topology can entertain.

(Hursh, 2008; Polesel, Rice, & Dulfer, 2013), and the unedifying spectacle of countries 'competing' in some global education race based on rankings (Lingard, Martino, & Rezai-Rashti, 2013).

When it comes to the database effect, the lack of deformation in the discursive topology means that forces continue to flow to and from a centre so as to form deference to the centre. This perpetuates the continual deference to a centre that allows for the application of binaries such as good/bad teaching, students, and leadership often at local sites. The database effect is associated with the channelling of the forces realised by deformations in at least one of the other topologies and the ways that the intersection changes through new intensities, flows and configurations. The persistence of the discursive topology means that, even though different forces are realised through the emergence of the global, new policy heterarchies and the intensification of testing within the assessment topology, the forces that flow across the surface continue to flow between secondary element and central element. These flows of data produces accountability, and despite the promise of an objective measure of teaching and student achievement through testing that enables constant and continual comparisons (the mesh network), in effect what is returned is a mode of disciplinarity limiting the possibilities of and for education assemblage (topology).

*Diagram 2: Star and Mesh Network Topologies*



An affect of oversight by a central testing agency is created; but the affect is produced through the (local) employment of data produced by a global testing agency in the reproduction of local disciplinarity. In the database effect all subjectivities of the local education topology (teachers, students, parents, policymakers, principals) enfold a sense of the publicness of their performance and the need to perform better in the face of the global public. This is an abstraction, however, as global data that uses representative samples to measure teaching and learning speaks of a general classroom rather than the specificity of an individual classroom. This continual and ultrarapid openness to scrutiny induces anxiety concerning the quality of (local) performance as professional lives become performativities ordered through “a baffling array of figures, indicators, comparisons

and forms of competition” that “become matters of self-doubt and personal anxiety rather than public debate” (Ball, 2003, p. 220). The employment of data enfolds the global testing topology to reassert the local and habitual, but in a different way. The discursive topology reinscribes (reterritorialises) moral encodings so it organises all points and elements around it as centre; so star topological qualities remain in effect. The local discursive topology does so by enfolding the testing topology through discursivity to produce anxiety around a ranking that displays our goodness and badness to all the other elements of the western education topology. Global policy convergence is a virtual process in which the local topological structure reasserts its control by projecting a global observational mesh in which everyone is caught.

The local remains the centre of the database effect. Within this global policy and testing machine, it remains the local context that reterritorialises on the disciplinary – the global tests are paid for by local governments who use the results to inform some discourses of education, sometimes as crisis, sometimes as improvement, but always as disciplinary. While a globalising education topology deterritorialises the institutional specificity of education assemblages in a global database effect that is not and cannot be disciplinary, this is swiftly reterritorialised on global rankings, competitive agendas, such as Australia’s goal to be “top 5 by 2025”, and the interpretation of these database effects as some measure of quality.

## Conclusion

While we think the database effect represents a characterisation of the return of disciplinarity effects within assemblages of control, this is not the point of this article. Rather, this was to suggest the utility of a topological approach to conceiving education in an increasingly networked society. For us, this is found in the way that a topological imagination allows for the persistence and co-operation of continually deforming multiplicities; rather than a (topographical) imagination that posits hierarchies of causation that have one structure as determinative (and as configuring the whole of space-time). A topological approach facilitates an appreciation of the enfolding of the testing topology in the local policy-making discursive topology. The deformations of the testing topology that have contributed so powerfully to the new topology have resulted both from innovations in digital technologies and from the increasingly datafied social accountability. These processes will continue and some other arrangement will emerge; and this arrangement can be best understood when conceived as a combination of the qualities of the surfaces that form part of the education topology.

## References

- Arkhangel'skii, A. (2012). *Topology, general*. Retrieved September 18th, 2013, from Encyclopedia of Mathematics: [http://www.encyclopediaofmath.org/index.php/Topology,\\_general](http://www.encyclopediaofmath.org/index.php/Topology,_general)
- Au, W. (2009). *Unequal By Design: High-Stakes Testing and the Standardization of Inequality*. New York: Routledge.
- Badiou, A. (2005). *Being and Event*. London: Continuum.



- Ball, S. (2003). The Teacher's Soul and the Terrors of Performativity. *Journal of Education Policy*, 18(2), 215-228.
- Ball, S. (2012). *Global Education Inc.: New Policy Networks and the Neoliberal Imaginary*. London: Routledge.
- Ball, S., & Junemann, C. (2012). *Networks, New Governance and Education*. Bristol: The Policy Press.
- Bernstein, B. (1971). On the classification and framing of educational knowledge. In M. Young, *Knowledge and Control*. London: Collier-Macmillan.
- Callahan, R. (1964). *Education and the cult of efficiency : a study of the social forces that have shaped the administration of the public schools*. Chicago: University of Chicago Press.
- Davies, B., & Harre, R. (1990). Positioning - the discursive production of selves. *Journal for the Theory of Social Behaviour*, 20(1), 43-63.
- de Freitas, E. (2014). Diagramming the classroom as topological assemblage. In M. Carlin, & J. Wallin, *For a people-yet-to-come: Deleuze and Guattari, politics and education*. New York: Continuum.
- Deleuze, G. (1995). Postscript on Control Societies. In G. Deleuze, *Negotiations* (pp. 177-182). New York: Columbia University Press.
- Deleuze, G. (2006). *The Fold: Leibniz and the Baroque*. London: Continuum.
- Deleuze, G., & Guattari, F. (2005). *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: The University of Minnesota Press.
- Foucault, M. (1991). *Discipline and Punish: The Birth of the Prison*. London: Penguin Books.
- Franklin, F. (1935). What is Topology? *Philosophy of Science*, 2(1), 39-47.
- Green, T. (1964-1965). A topology of the teaching concept. *Studies in Philosophy and Education*, 3(4), 284-319.
- Grek, S. (2009). Governing by numbers: the PISA 'effect' in Europe. *Journal of Education Policy*, 24(1), 23-37.
- Grek, S. (2013). Expert moves: international comparative testing and the rise of expertocracy. *Journal of Education Policy*, DOI: 10.1080/02680939.2012.758825, 1-15.
- Hacking, I. (1990). *The Taming of Chance*. Cambridge: Cambridge University Press.
- Harvey, P. (2012). The Topological Quality of Infrastructural Relation: An Ethnographic Approach. *Theory, Culture & Society*, 29 (4/5), 76–92.
- Hursh, D. (2008). *High-stakes Testing and the Decline of Teaching and Learning*. Lanham, MD: Rowman and Littlefield Publishers.

- Jones, B. (2008). The unintended outcomes of high-stakes testing. *Journal of Applied School Psychology, 23*(2), 65-86.
- Kalaidjian, W. (2012). Traversing Psychosis: Lacan, Topology, and 'The Jet-Propelled Couch'. *American Imago, 69*(2), 185-213.
- Lambert, G. (2005). Expression. In C. Stivale, *Gilles Deleuze: Key Concepts* (pp. 31-41). Montreal & Kingston: McGill-Queen's University Press.
- Lash, S. (2012). Deforming the Figure: Topology and the Social Imaginary. *Theory, Culture & Society, 29*(4/5), 261–287.
- Lingard. (2010). Policy borrowing, policy learning: testing times in Australian schooling. *Critical Studies in Education, 51*(2), 129-145.
- Lingard, B., Martino, W., & Rezai-Rashti, G. (2013). Testing regimes, accountabilities and education policy: commensurate global and national developments. *Journal of Education Policy, DOI: 10.1080/02680939.2013.820042*, 1-16.
- Lingard, S., & Sellar, S. (2013). Globalization, edu-business and network governance: the policy sociology of Stephen J. Ball and rethinking education policy analysis. *London Review of Education, 11*(3), 265-280.
- Lury, C., Parisi, L., & Terranova, T. (2012). Introduction: The Becoming Topological of Culture. *Theory, Culture & Society, 29*(4/5), 3-35.
- Lyotard, J.-F. (1993). *Libidinal Economy*. Bloomington: Indiana University Press.
- MacGregor Wise, J. (2005). Assemblage. In C. J. Stivale, *Gilles Deleuze: Key Concepts*. (pp. 77-97). Montreal: McGill-Queen's University Press .
- Mansfield, M. (1963). *Introduction to Topology*. Princeton: Van Nostrand.
- Marres, N. (2012). On Some Uses and Abuses of Topology in the Social Analysis of Technology (Or the Problem with Smart Meters). *Theory, Culture & Society, 29*(4/5), 288–310.
- Mezzadra, S., & Neilson, B. (2012). Between Inclusion and Exclusion: On the Topology of Global Space and Borders. *Theory Culture Society, 29*(4/5), 58-75.
- Michael, M., & Rosengarten, M. (2012). HIV, Globalization and Topology: Of Prepositions and Propositions. *Theory, Culture and Society, 29*(4/5), 93–115.
- Olsen, M. (1999). *Michel Foucault: Materialism and Education*. Westport: Bergin and Garvey.
- O'Sullivan, S. (2006). Pragmatics for the Production of Subjectivity: Time for Probe-Heads. *Journal for Cultural Research, 10*(4), 309-323.
- Polesel, J., Rice, S., & Dulfer, N. (2013). The impact of high-stakes testing on curriculum and pedagogy: a teacher perspective from Australia. *Journal of Education Policy, DOI: 10.1080/02680939.2013.865082*, 1-18.

- Power, M. (1999). *The Audit Society: Rituals of Verification*. Oxford: Oxford University Press.
- Rizvi, F., & Lingard, B. (2010). *Globalizing Education Policy*. Abingdon: Routledge.
- Ruppert, E. (2012). The Governmental Topologies of Database Devices. *Theory, Culture & Society*, 116-136.
- Sahlberg, P. (2011). The Fourth Way of Finland. *Journal of Educational Change*, 12(2), 173-185.
- Shields, R. (2012). Cultural Topology: The Seven Bridges of Königsburg, 1736. *Theory Culture & Society*, 29(4/5), 43-57.
- Sloterdijk, P. (2012). Nearness and Da-sein: The Spatiality of Being and Time. *Theory, Culture & Society*, 29(4/5), 36–42.
- Smolin, L. (2013). *Time Reborn: From the Crisis in Physics to the Future of the Universe*. Boston: Houghton Mifflin Harcourt.
- Stobart, G. (2008). *Testing times: The uses and abuses of assessment*. . London: Routledge.
- Thompson, G. (2010). Acting, Accidents and Performativity: Challenging the Hegemonic Good Student in Secondary Schools. *British Journal of Sociology of Education*, 31(4), 413-430.
- Thompson, G., & Cook, I. (2012). Spinning in the NAPLAN Ether: 'Postscript on the Control Societies' and the Seduction of Education in Australia. *Deleuze Studies*, 6(4), 564-584.
- Virilio, P. (1986). *Speed and politics: An essay on dromology*. New York: Semiotext(e).